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Association of Platelet Count with Severity of COVID-19 Infection at the Time of Admission in Pakistan: A Retrospective Study

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ABSTRACT

Objective: To determine the association of platelet count with the severity of COVID-19 infection.
Study Design: Retrospective longitudinal study.
Place and Duration of Study: Mayo Hospital, Lahore Pakistan, from Aug 2020 and Aug 2021.
Methodology: Data was recorded in a proforma. The severity of COVID-19 infection, based on physical examination and saturation measured on a pulse oximeter recorded at the time of presentation to the hospital, was noted. A platelet count was obtained from a complete blood count at the presentation time. Platelet counts were compared in patients with non-severe infection and severe infection.
Results: The mean age of the patients was 50.11±14.20 years. Out of 200 patients, 134 (67%) were male and 66 (33%) were female. Sixty-three (31.5%) patients had non-severe, while 137 (68.5%) had severe COVID-19 symptoms. A significant association was seen between the severity of illness and platelet count at the time of presentation, with a *p*-value of 0.047.
Conclusion: This study shows that in COVID-19 patients, thrombocytopenia at the time of presentation to the hospital is associated with severe disease.

Keywords: Platelet Count, Severity of COVID-19 Infection, Thrombocytopenia

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INTRODUCTION

In the scenario of repeated surges in the cases of COVID-19, markers predicting severe disease will help manage patients. Studies conducted so far have revealed neutrophil-lymphocyte ratio (NLR), C reactive protein (CRP), d-dimers, lactate dehydrogenase levels (LDH), platelet count, ferritin, lymphocyte count, and albumin can be used as a predictor of severe disease.[1,2] Studies show thrombo-cytopenia as one of the haematological features of COVID-19, and it has been linked to the severity of COVID-19 infection.[3-5] Several mechanisms have been suggested for this finding, which include bone marrow infection, direct infection of platelets with the virus, as an outcome of cytokine storm and immune-mediated destruction of platelets.[6-8] The dilemma faced, particularly in developing countries like Pakistan, is that patients frequently present late in their illness, where myths associated with COVID-19 prevent the patients from presenting early in the health care facilities.[1,9] Considering this scenario in our population, it is imperative to look into the association of some markers and the severity of COVID-19 at the time of presentation. This study aimed to determine the association of platelet count as a marker of the severity of COVID-19 infection at the time of presentation to the hospital. This would help the physician predict the disease's severity, thus enabling them to tailor their treatment accordingly for a better patient outcome.

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METHODOLOGY

The retrospective longitudinal study was conducted in the COVID-19 units of Mayo Hospital, Lahore Pakistan, from August 2020 to August 2021 after obtaining approval from Institutional Board Review (ltr no. 584/RC/KEMU). The sample size was calculated by using the sample size calculation formula, using a prevalence of 15%.[10]

Inclusion Criteria: COVID-19-infected patients of either gender, aged 20-70 years, diagnosed via polymerase chain reaction on nasopharyngeal or oropharyngeal swabs were included.

Exclusion Criteria: Patients with deranged renal function, liver function tests and sepsis, patients with platelet disorders or those already taking medications which could lead to thrombocytopenia.

A total of two hundred patients of COVID-19 who were admitted between March and August 2020 were recruited in this study. Patients were selected through consecutive sampling for the study. Data was collected from hospital records on a predesigned proforma. Demographic information such as name, age, and gender were noted. It was a retrospective cohort study. Patients' saturation and platelet counts at the time of admission were noted. Patients were categorized into non-severe and severe groups based on oxygen saturation at the time of presentation. i.e., patients with 94% or more saturation at room air at the time of presentation were categorized as having non-severe disease. In comparison, those with less than 94% saturation at room air were categorized as having severe disease.[11]

Statistical Package for Social Sciences (SPSS) version 22.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

Sixty-three (31.5%) patients had non-severe symptoms, while 137(68.5%) had severe COVID-19 symptoms. Out of 137 having severe disease, 24 patients (17.51%) had low platelet count (*p*-value 0.047), while only 4(6.34%) patients out of 63 having non-severe disease had low platelet count. The mean age of the patients was 50.11+14.20 years. Out of 200 patients enrolled, 134(67%) were male and 66(33%) were female. In the category of severe disease, 69.34% were males, and 30.65% were females, while in the non-severe group, 61.9 % were males and 38.09% were females. The average oxygen saturation in the Severe Disease Group was 81.57+8.96%, and in the Non-Severe Group was 97.27+1.70% (Table).

Table: Association Between Severity of COVID-19 Infection and Platelet Count (n=200)

Parameters	Non severe (n=63)		Severe (n=137)		*p*-value
Age in years	39.56±13.73		54.96±11.57		0.001
Gender Distribution	Males	Females	Males	Females	0.299
	39(61.90%)	24(38.09%)	95(69.34%)	42(30.65%)	
Oxygen Saturation	97.27±1.70		81.57±8.96		0.001
Platelet Count	Low	Normal/high	Low	Normal/high	0.047
	4(6.34%)	59(93.65%)	24(17.51%)	113(82.48%)	

DISCUSSION

SARS-COV-2 is one of the seven known variants of coronavirus. It is known to affect almost all of the body systems, in particular the lungs, by causing COVID-19 pneumonia, which has an in-hospital mortality rate of around 4-15%.[11-13] Various haemato-logical manifestations are seen in this disease. Many of them have been used as an indicator to mark the severity of the disease. These include NLR, white blood cell (WBC) count, platelet count, CRP, D-Dimers, LDH levels, ferritin levels, fibrinogen and procalcitonin.[14,15]

In our study, we studied the platelet levels as a marker of disease severity at the time of presentation to the hospital. We retrospectively analyzed the data of 200 patients admitted with COVID-19. Our study showed that many patients with low platelet counts had more severe disease at the time of admission, making it a useful marker for assessing the severity of the disease at the time of presentation. In addition, there was a significant difference in the age of the patients who developed severe illness, showing that the elderly population is more prone to develop severe features of COVID-19 as compared to the younger age group.

Unlike our study, in which we had assessed the disease severity at the point of presentation to the hospital, Bi *et al*. assessed the severity of the disease throughout the illness. They concluded that platelet levels less than 135,000/mm^3 at the time of presentation are a predictor of developing severe disease over time.[16]

Thrombocytopenia is also used as a marker for predicting mortality in COVID-19 patients. In a study by Liu Y *et al*., it was concluded that thrombocy-topenia is an independent risk factor for predicting mortality in COVID-19 patients.[17] Zhao *et al.*, in their study, followed the trend of platelet levels during COVID-19 disease in patients. They concluded that the falling trend of the platelets, particularly early in the disease, is associated with higher mortality rates.[18] The presence of thrombocytopenia has also been reported to be associated with refractory illness.[19]

Thrombocytopenia is seen in approximately 5 to 41.7% of cases of COVID-19.[20] In a study carried out by Guan *et al.*, 36.2% of 1099 patients included in their

study had a platelet count lower than 150,000/mm^3 at the time of admission.[21] However, in our study, only 14% of the patients had platelet counts lower than 150,000/mm^3 at the presentation time. The possible mechanism of developing thrombocytopenia is the destruction of the platelets mediated by antibodies and immune complexes generated by SARS-CoV-2 infection.[22]

The degree of thrombocytopenia seen with COVID-19 is mostly mild, with platelet counts between 100,000/mm^3 and 150,000/mm^3. A marked fall in platelet levels is not seen even in severe disease, as a compensatory response is generated that enhances the production of platelets. Hence, severe thrombocytopenia in COVID-19 is seen only in rare instances, e.g., cases where ITP-like states are present, or the patient is overwhelmed by severe sepsis.[20]

Platelet count in COVID-19 could be used as a disease severity predictor, thus aiding physicians in identifying patients who could develop severe disease during their hospital stay and helping them decide their treatment and management strategy by apprehending the severity of the disease that the patient might develop.

LIMITATION OF STUDY

To further validate this tool for assessing and predicting the severity of COVID-19, it was necessary to follow the platelet count over the course of the illness and simultaneously assess the disease severity.

CONCLUSION

This study shows that thrombocytopenia at the time of presentation to the hospital is a marker of severe disease in COVID-19 patients.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

AFB & MC: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

LRB & WA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

NB & KR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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